

What is claimed is:

1. A detecting chip for single base substitution SNP and point mutation of genes, comprising:

a closed internal space part capable of being filled with and emptied of DNA samples;

a plurality of measuring electrodes positioned in said space part; and

a counter electrode positioned in said space part and not in contact with any of said plurality of measuring electrodes;

wherein one of a plurality of PCR products or oligonucleotides is immobilized on one of said plurality of measuring electrodes; and

wherein voltage applied between said counter electrode and said plurality of measuring electrodes generates electric current between said counter electrode and said plurality of measuring electrodes.

2. A detecting chip for single base substitution SNP and point mutation of genes, comprising:

a closed internal space part capable of being filled with and emptied of DNA samples;

a plurality of measuring electrodes positioned in said space part; and

a counter electrode positioned in said space part and not in contact with any of said plurality of measuring electrodes;

wherein each of a separate one of a plurality of PCR products or oligonucleotides is immobilized on a separate respective one of said plurality of measuring electrodes; and

wherein voltage applied between said counter electrode and said plurality of measuring electrodes generates electric current between said counter electrode and said plurality of measuring electrodes.

3. The detecting chip of claim 1 wherein said measuring electrodes comprise gold.

4. The detecting chip of claim 2 wherein said measuring electrodes comprise gold.

5. The detecting chip of claim 1 wherein each of said plurality of measuring electrodes is operatively connected to a respective electrically conductive terminal.

6. The detecting chip of claim 2 wherein each of said plurality of measuring electrodes is operatively connected to a respective electrically conductive terminal.

7. The detecting chip of claim 1, configured for removable insertion into a measuring apparatus and for disconnectable electrical connection to said measuring apparatus.

8. The detecting chip of claim 2, configured for removable insertion into a measuring apparatus and for disconnectable electrical connection to said measuring apparatus.

9. The detecting chip of claim 1 incorporated in a card.

10. The detecting chip of claim 2 incorporated in a card.

11. The detecting chip of claim 1 incorporated in a cassette.

12. The detecting chip of claim 2 incorporated in a cassette.

13. The detecting chip of claim 1 incorporated in a disk.

14. The detecting chip of claim 2 incorporated in a disk.

15. The detecting chip of claim 1, comprising a body and an upper cover.

16. The detecting chip of claim 2, comprising a body and an upper cover.

17. A system for detection of single base substitution SNP and point mutation of genes, comprising:

a closed internal space part capable of being filled with and emptied of DNA samples;

a plurality of measuring electrodes positioned in said space part; and

a counter electrode positioned in said space part and not in contact with any of said plurality of measuring electrodes; and

a measuring apparatus for detecting electric current between said counter electrode and said plurality of measuring electrodes;

wherein one of a plurality of PCR products or oligonucleotides is immobilized on one of said plurality of measuring electrodes.

18. A system for detection of single base substitution SNP and point mutation of genes, comprising:

a closed internal space part capable of being filled with and emptied of DNA samples;

a plurality of measuring electrodes positioned in said space part; and

a counter electrode positioned in said space part and not in contact with any of the said plurality of measuring electrodes; and

a measuring apparatus for detecting electric current between said counter electrode and said plurality of measuring electrodes;

wherein each of a separate one of a plurality of PCR products or oligonucleotides is immobilized on a separate respective one of said plurality of measuring electrodes.

19. The system of claim 17, wherein

said internal space part, said measuring electrodes and said counter electrode are incorporated in a detecting chip; and

said detecting chip is configured for removable insertion into said measuring apparatus and for disconnectable electrical connection to said measuring apparatus.

20. The system of claim 18, wherein

said internal space part, said measuring electrodes and said counter electrode are incorporated in a detecting chip; and

said detecting chip is configured for removable insertion into said measuring apparatus and for disconnectable electrical connection to said measuring apparatus.

21. A system for detection of single base substitution SNP and point mutation of genes, comprising:

the detecting chip of claim 1; and
a measuring apparatus for detecting electric current between said counter electrode and said plurality of measuring electrodes,
wherein said detecting chip is configured for removable insertion into said measuring apparatus and for disconnectable electrical connection to said measuring apparatus.

22. A system for detection of single base substitution SNP and point mutation of genes, comprising:

the detecting chip of claim 2; and
a measuring apparatus for detecting electric current between said counter electrode and said plurality of measuring electrodes,
wherein said detecting chip is configured for removable insertion into said measuring apparatus and for disconnectable electrical connection to said measuring apparatus.

23. The system of claim 17 wherein media is positioned in said space part and the temperature of the media is controlled.

24. The system of claim 18 wherein media is positioned in said space part and the temperature of the media is controlled.

25. The system of claim 19 wherein media is positioned in said space part and the temperature of the media is controlled.

26. The system of claim 20 wherein media is positioned in said space part and the temperature of the media is controlled.

27. The system of claim 23 wherein a peltier device is used to control the temperature of said media.

28. The system of claim 24 wherein a peltier device is used to control the temperature of said media.

29. The system of claim 25 wherein a peltier device is used to control the temperature of said media.

30. The system of claim 26 wherein a peltier device is used to control the temperature of said media.

31. A method for detecting single base substitution SNP and point mutation of genes, said method comprising the steps of:

placing nucleic acid sequence samples or gene-amplified nucleic acid sequence samples in said space part of the detecting chip of claim 1 to form double strands with one of the said plurality of PCR products or oligonucleotides;

placing an electrolyte including an electrochemically active molecule in said space part;

controlling the temperature at which said double strands are formed; and

detecting single base substitution SNP and point mutation of DNA samples by detecting electric currents between said counter electrode and each of said plurality of measuring electrodes.

32. A method for detecting single base substitution SNP and point mutation of genes, said method comprising the steps of:

placing nucleic acid sequence samples or gene-amplified nucleic acid sequence samples in said space part of the detecting chip of claim 2 to form double strands with one of the said plurality of PCR products or oligonucleotides;

placing an electrolyte including an electrochemically active molecule in said space part;

controlling the temperature at which said double strands are formed; and

detecting single base substitution SNP and point mutation of DNA samples by detecting electric currents between said counter electrode and each of said plurality of measuring electrodes.

33. A method for detecting single base substitution SNP and point mutation of genes, said method comprising the steps of:

placing nucleic acid sequence samples or gene-amplified nucleic acid sequence samples in said space part of the system of claim 17 to form double strands with one of the said plurality of PCR products or oligonucleotides;

placing an electrolyte including an electrochemically active molecule in said space part;

controlling the temperature at which said double strands are formed; and

by detecting electric currents between said counter electrode and each of said plurality of measuring electrodes.

34. A method for detecting single base substitution SNP and point mutation of genes, said method comprising the steps of:

placing nucleic acid sequence samples or gene-amplified nucleic acid sequence samples in said space part of the system of claim 18 to form double strands with one of the said plurality of PCR products or oligonucleotides;

placing an electrolyte including an electrochemically active molecule in said space part;

controlling the temperature at which said double strands are formed; and

detecting single base substitution SNP and point mutation of DNA samples by detecting electric currents between said counter electrode and each of said plurality of measuring electrodes.

35. A method for detecting single base substitution SNP and point mutation of genes, said method comprising the steps of:

placing nucleic acid sequence samples or gene-amplified nucleic acid sequence samples in said space part of the system of claim 19 to form double strands with one of the said plurality of PCR products or oligonucleotides;

placing an electrolyte including an electrochemically active molecule in said space part;

controlling the temperature at which said double strands are formed; and

detecting single base substitution SNP and point mutation of DNA samples by detecting electric currents between said counter electrode and each of said plurality of measuring electrodes.

36. A method for detecting single base substitution SNP and point mutation of genes, said method comprising the steps of:

placing nucleic acid sequence samples or gene-amplified nucleic acid sequence samples in said space part of the system of claim 20 to form double strands with one of the said plurality of PCR products or oligonucleotides;

placing an electrolyte including an electrochemically active molecule in said space part;

controlling the temperature at which said double strands are formed; and
detecting single base substitution SNP and point mutation of DNA samples by detecting electric currents between said counter electrode and each of said plurality of measuring electrodes.